

Of the patients receiving less than 6 mg. a day, only three suffered any discomfort, and it is suggested that this is the highest maintenance dose which can be prolonged.

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## CIRCULATORY EFFECTS OF TRUMPET PLAYING

BY

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It is well known among professional trumpeters that playing high loud notes for more than a few seconds may cause dizziness or occasionally "black-out." Indeed, many leading orchestras carry an assistant or "mate" to take over from the first trumpet in prolonged difficult passages. All are agreed that Wagner is the composer with least consideration for the feelings of the trumpet player. The mechanisms causing dizziness appear obvious, but it seemed worth while to obtain continuous records of the pressures blown and their consequent circulatory effects, since observation suggested that greater pressures across the vibrating aperture were needed in trumpet playing than in any other commonly used instrument.

#### Material and Methods

The measurements were made on one of us (M. F.), who is a professional player and teacher of the trumpet. Some measurements were also made on two other subjects: an amateur surgical colleague, who played in the Cambridge University dance band 30 years ago, and a novice member of the department who purports to be learning the oboe. Pressures were measured with capacitance manometers, mouth pressure with a fine water-filled "polythene" tube, and intrathoracic pressure in the oesophagus (Dornhorst and Leathart, 1952). The trumpet was held and played with the right hand, while arterial pressure was recorded in the left brachial artery.

#### Results

As expected, the circulatory effects of trumpet playing are similar to the effects of the Valsalva manoeuvre. Fig. 1 shows the professional playing Concert A moderately loudly for 17 seconds. The pressure blown is about 80 mm. Hg, or a good deal higher than the 50 mm. Hg normally used to test the circulation (Sharpey-Schafer, 1955). The subject maintains a relatively constant pressure in producing his note, yet very few normal subjects are capable of

blowing a mercury manometer to this height and maintaining it at a constant level without extensive practice. The effects on the circulation are those of a formidable Valsalva manoeuvre: peripheral venous valves shut and blood accumulates distal to them. The effective cardiac-filling pressure, stroke output, and mean arterial pressure fall off rapidly. After about 7 seconds the slight rise of arterial pressure indicates the onset of reflex constriction, which persists, after cessation of blowing, during the overshoot. Since the brain is not protected by venous valves the supply pressure across it falls so that the cerebral blood flow may become inadequate during the period of blowing. More usually dizziness or black-out is maximal immediately on release of intrathoracic pressure, as occurred on the occasion of recording Fig. 1.

In Fig. 2 the professional is shown blowing a loud arpeggio up to high D. On the top note he reached a pressure of 160 mm. Hg. Thereafter he blew a series of rapid blasts which produced rapid transients on the arterial pressure curve. In Fig. 3 he is playing a long phrase from Wagner at a relatively low pressure; circulatory changes are still conspicuous. It is interesting to compare the performance of the amateur and the novice with that achieved by the professional.

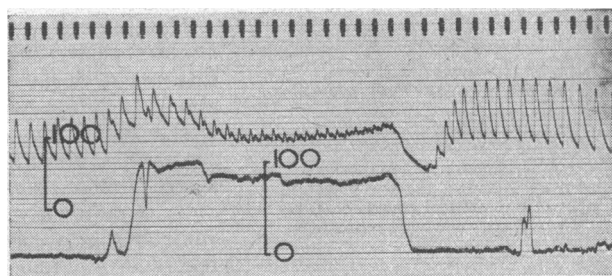


FIG. 1.—Professional player blowing Concert A for 17 seconds. Upper curve, arterial pressure. Lower curve, mouth pressure. Calibration in mm. Hg and time marker in seconds in this and subsequent figures.

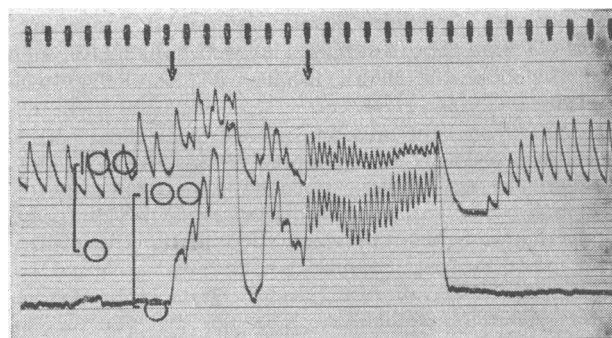


FIG. 2.—At the first arrow an arpeggio is blown to high D (160 mm. Hg mouth pressure). At the second arrow a series of rapid blasts are blown for 6 seconds.

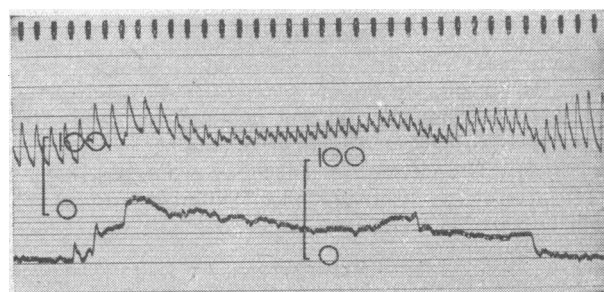


FIG. 3.—A long (28 seconds) phrase is played from *Tannhäuser* without drawing breath.

The amateur was capable of maintaining a note for nearly as long as the professional at 75 mm. Hg. When asked to blow an arpeggio he reached high C but only 110 mm. Hg mouth pressure. The volume of sound produced was less. The maximum pressure produced by the novice was 60 mm. Hg for any recognizable note.

Teachers of musical instruments or singing have curious ideas of anatomy and physiology, and they are apt to spur on their pupils with quite erroneous views on how air is expelled from the chest. It is possible, however, that they achieve success by persuading the pupil to produce uninhibited effort, for when the professional was asked to blow a mercury manometer, an instrument with which he was unacquainted, he could only achieve 80 mm. Hg. On the other hand, the novice, who could blow a trumpet only to 60 mm. Hg, easily blew the mercury to 160 mm., for he had many years' practice at this procedure (Fig. 4). These results

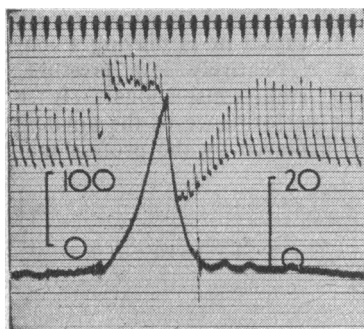


FIG. 4.—A mercury manometer is blown to 160 mm. Hg for 6 seconds. Upper curve, arterial pressure. Lower curve, forearm venous pressure.

suggest that it might be useful to record mouth or intrathoracic pressures during training in order to demonstrate errors in technique.

The trumpet appears to be the instrument requiring the highest intrathoracic pressures. Oboe players reach 60 mm. Hg only occasionally, while the amateur recorded 40 mm.

Hg mouth pressure when playing loud high notes on the French horn. Although trumpet playing produces high intrathoracic pressures compared with other instruments and normal straining, it still does not approach the pressure levels induced by coughing. Over 200 mm. Hg is common in well-built males, and 450 mm. Hg for many seconds has been recorded (Sharpey-Schafer, 1953).

Apart from the discomfort of occasional dizzy sensations or black-outs, trumpet players are not likely to come to any harm. Vasodilatation from heat or previous hyperventilation will exaggerate the effects of a given intrathoracic pressure. It is better to sit than stand, but the strict supine posture, which would be better still, seems hardly feasible. For orchestras in severe financial difficulties it might be possible to dispense with the assistant or "mate" if the trumpeter wore a pilot's pressure-suit, which could be surreptitiously inflated by a switch on the conductor's desk.

#### Summary

Continuous mouth and arterial pressures were recorded during trumpet playing. A professional reached 160 mm. Hg blown pressure on loud high notes; less skilled performers were unable to reach such pressures. The circulatory effects of prolonged playing were those of a formidable Valsalva manoeuvre. Dizziness or black-out may result.

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## ON RUBELLA IN PREGNANCY

BY

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In the fifth James Mackenzie Lecture Dr. G. F. Abercrombie (1959) described the following sequence of events experienced by a patient who had sought his advice: "A lady, 14 weeks pregnant, and her 4-year-old daughter, simultaneously developed german measles. The mother knew all there was to be known at that time about pregnancy and german measles, and I immediately obtained confirmation of the diagnosis from a dermatologist. Thence to an obstetrician who, though clearly in favour of terminating the pregnancy, asked that his opinion be confirmed by a colleague. The second was just as hesitant as the first, and I had finally to take her to a physician before the operation could be done. This physician simply said, 'You can't do anything else.'" Yes, indeed; by this time, having been to five doctors, none of whom could reassure her or allay her fears, there could be no alternative, for psychological reasons if for no others.

Dr. Abercrombie does not state when he saw this patient. If it was as far back as 1940-5 the doubt and hesitation on the part of her advisers was understandable, and even commendable, but to publish such an account to-day, as if such conduct of a case may still be excusable, seems to me to be unfortunate and possibly to invite the recurrence of doubt and hesitancy on the part of other practitioners presented with the problem.

#### Suggestions for the G.P.

Having considered this problem in some detail, I think that, though no definite calculation of the risks involved is yet possible, we are able to suggest certain rules for the guidance of the practitioner until more exact facts can be given, so that he should no longer have to consult colleagues who really know no more on the subject than he does; for though Dr. Abercrombie apparently scorns statisticians and refuses to take notice of percentages, in such a problem only statistics can give the help needed. He is right, however, to be cautious in accepting a simple percentage as a guide without careful consideration of the material on which it is based, on the numbers concerned, and on the snags involved, which may differ from one sample of material to another and which do make this particular problem a very elusive one.

Now the facts of the situation have accumulated so that one can state without doubt that rubella in the early weeks of pregnancy is such a menace to the normal development of the foetus that it constitutes a risk one cannot allow to be taken for the unborn child. Abortion has become the generally recognized treatment in such a case; to such an extent has this become routine treatment that maybe we can no longer hope to get a measure of the risk involved or discover what proportion of such occurrences can be expected to result in a normally developed child. The important question we have to decide is at what stage of pregnancy the occurrence of rubella constitutes no menace to the child, or so small a risk that routine abortion can no longer be justified. I would, in the present state of our knowledge, suggest 12 weeks as the limiting time; a patient coming